

# ENGINEERING CHANGE NOTICE

Page 1 of 2

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Proj.  
ECN

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	6. Project Title/No./Work Order No. <b>Tank 241-C-204</b>	7. Bldg./Sys./Fac. No. <b>NA</b>	8. Approval Designator <b>NA</b>	
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12a. Modification Work <input type="checkbox"/> Yes (fill out Blk. 12b) <input checked="" type="checkbox"/> No (NA Blks. 12b, 12c, 12d)	12b. Work Package No. <b>NA</b>	12c. Modification Work Complete <b>NA</b> Design Authority/Cog. Engineer Signature & Date	12d. Restored to Original Condition (Temp. or Standby ECN only) <b>NA</b> Design Authority/Cog. Engineer Signature & Date
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13a. Description of Change <b>Add Appendix C, Evaluation to Establish Best-Basis Inventory for Single-Shell Tank 241-C-204.</b>	13b. Design Baseline Document? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
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14a. Justification (mark one)			
Criteria Change <input type="checkbox"/>	Design Improvement <input type="checkbox"/>	Environmental <input type="checkbox"/>	Facility Deactivation <input type="checkbox"/>
As-Found <input checked="" type="checkbox"/>	Facilitate Const <input type="checkbox"/>	Const. Error/Omission <input type="checkbox"/>	Design Error/Omission <input type="checkbox"/>

14b. Justification Details

An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities. As part of this effort, an evaluation of available information for single-shell tank 241-C-204 was performed, and a best-basis inventory was established. This work follows the methodology that was established by the standard inventory task.

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## Tank Characterization Report for Single-Shell Tank 241-C-204

B. C. Simpson and R. T. Winward (Meier Associates)  
Lockheed Martin Hanford Corporation, Richland, WA 99352  
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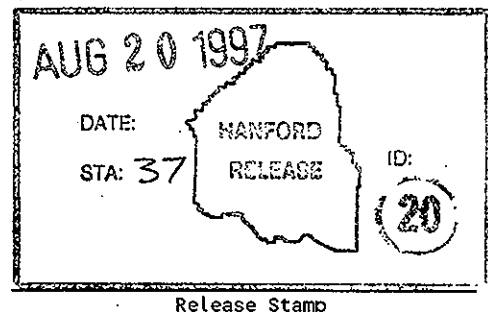
**Abstract:** An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities. As part of this effort, an evaluation of available information for single-shell tank 241-C-204 was performed, and a best-basis inventory was established. This work follows the methodology that was established by the standard inventory task.

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## **APPENDIX C**

# **EVALUATION TO ESTABLISH BEST-BASIS INVENTORY FOR SINGLE-SHELL TANK 241-C-204**

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**APPENDIX C****EVALUATION TO ESTABLISH BEST-BASIS INVENTORY FOR  
SINGLE-SHELL TANK 241-C-204**

An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities (Hodgson and LeClair 1996). As part of this effort, an evaluation of available information for single-shell tank 241-C-204 was performed, and a best-basis inventory was established. This work, detailed in the following sections, follows the methodology that was established by the standard inventory task. The following evaluation provides a best-basis inventory estimate for chemical and radionuclide components in tank 241-C-204.

**C1.0 CHEMICAL INFORMATION SOURCES**

Data sources for tank 241-C-204 include the following:

- Mean characterization results and inventory estimates from a core sample obtained in 1978 from tank 241-C-201 (Horton 1978). The sample had limited information collected from it, and no associated quality control assays. The process history information for the 241-C-200 tanks suggests that they all received the same waste, therefore data from tank 241-C-201 is used as a basis for tank 241-C-204.
- Two auger samples were obtained from tank 241-C-204 for safety screening analysis in 1995 (Conner 1996); however, the data obtained did not substantially contribute to the chemical information available.
- The Hanford Defined Waste (HDW) model (Agnew et al. 1997a) provides tank contents estimates, derived from process flowsheets and waste volume records.

**C2.0 COMPARISON OF COMPONENT INVENTORY VALUES**

The 1978 data-based inventory estimate for tank 241-C-204, adjusted to the volume of tank 241-C-204, and the tank 241-C-204 inventory estimate from the HDW model (Agnew et al. 1997a) are shown in Table C2-1 and C2-2. Each estimate, however, has a different density basis.

The HDW inventory estimates use a waste volume of 11.4 kL (3 kgal), and a waste density of 1.61 g/mL. The data-based inventory uses a volume of 11.4 kL (3 kgal), and a measured bulk density of 1.16 g/mL as bases. Because of the difference between the two estimates for the mass basis (relative percent difference = 32.5 percent), many differences between the data-based and HDW model inventories are observed.

Estimates obtained from the two methods for most analytes vary by a factor of two or more. The chemical species in this section are reported without charge designation per the best-basis inventory convention.

Table C2-1. Data-Based and Hanford Defined Waste Model-Based Inventory Estimates for Nonradioactive Components in Tank 241-C-204.

Analyte	Data-based inventory estimate <sup>a</sup> (kg)	HDW model inventory estimate <sup>b</sup> (kg)	Analyte	Data-based inventory estimate <sup>a</sup> (kg)	HDW model inventory estimate <sup>b</sup> (kg)
Al	21.2	0	NO <sub>3</sub>	437	34.6
Bi	NR	0	OH	66.2 <sup>c</sup>	2,540
Ca	NR	26.1	Pb	NR	119
Cl	26.4	5.80	PO <sub>4</sub>	1,950	288
Cr	1.77	1.83	Si	49.4	0.36
F	6.59	0	SO <sub>4</sub>	NR	85.8
Fe	817	1,250	Sr	NR	0
K	5.28	10.9	TIC as CO <sub>3</sub>	264	859
NH <sub>3</sub>	NR	16.2	TOC	27.3	77.0
Na	357	1,040	U <sub>TOTAL</sub>	0.875	3,160
Ni	106	41.4	Zr	NR	0
NO <sub>2</sub>	13.2	158	H <sub>2</sub> O (Wt%)	68.0	46.0
			Density (kg/L)	1.16	1.61

HDW = Hanford Defined Waste

NR = Not reported

<sup>a</sup> Derived from data for tank 241-C-201 (Horton 1978) and adjusted to the volume of tank 241-C-204

<sup>b</sup> Agnew et al. (1997a)

<sup>c</sup> Obtained from soluble portion only.



Table C2-2. Data-Based and Hanford Defined Waste Model-Based Inventory Estimates for Radioactive Components in Tank 241-C-204.

Analyte	Data-based inventory estimate <sup>a</sup> (Ci)	HDW model inventory estimate <sup>b</sup> (Ci)
<sup>137</sup> Cs	101	17.6
<sup>239/240</sup> Pu	30	16.5
<sup>90</sup> Sr	540	30,800
Total α	0.42 <sup>c</sup>	NR

HDW = Hanford Defined Waste

NR = Not reported

<sup>a</sup> Derived from Horton (1978)

<sup>b</sup> Agnew et al. (1997a)

<sup>c</sup> Based on analyses of 1995 auger samples from tank 241-C-204 (Conner 1996).

### C3.0 COMPONENT INVENTORY EVALUATION

The following evaluation of tank contents is performed in order to identify potential errors and/or missing information that would influence the sampling-based and HDW model component inventories. The types and volumes of solids accumulated in tank 241-C-204 reported by various authors is compiled in Tables C3-1, C3-2, and C3-3.

#### C3.1 CONTRIBUTING WASTE TYPES

The process history documents indicate the tank received mostly metal waste (MW) and Hot Semiworks/Strontium Semiworks (HS/SSW) waste while the tank was active. Tank 241-C-204 went into service in 1947, receiving metal waste through a diversion box (Agnew et al. 1997b). Metal waste sludge, which originated from uranium fuel dissolution in the bismuth phosphate process, was then sluiced from waste storage tanks, and the uranium in the waste was separated from fission products using a solvent extraction process based on tri-butyl phosphate. Most of the metal waste was removed from the tank in 1954 during the uranium recovery campaign. For the remainder of its service life, from 1955 to 1976, tank 241-C-204 received and stored HS/SSW (Agnew et al. 1997b). Because of the supporting information from process history, for purposes of this evaluation, the tank inventory is considered to be entirely HS/SSW.

Table C3-1. Waste Inventory of Tank 241-C-204 (Hanlon 1997).

Waste	Volume (kL)	Volume (kgal)
Sludge	11.4	3
Saltcake	0	0
Supernatant	0	0
Drainable Interstitial Liquid	0	0
Total Waste	11.4	3

Table C3-2. Expected Solids for Tank 241-C-204.

Reference	Waste Type
Anderson (1990)	MW, HS/SSW
SORWT Model (Hill et al. 1995)	HS/SSW
WSTRS (Agnew et al. 1997b)	MW, HS/SSW
HDW Model (Agnew et al. 1997a)	MW, HS/SSW

HDW = Hanford Defined Waste

HS/SSW = Hot Semiworks/Strontium Semiworks

MW = Metal waste

SORWT = Sort on Radioactive Waste Type

WSTRS = Waste Status and Transaction Record Summary.

Table C3-3. Hanford Defined Waste Model Solids for Tank 241-C-204.

HDW solids layer	kL	kgal
MW	7.6	2
HS/SSW	3.8	1
Total HDW Volume	11.4	3

HDW = Hanford Defined Waste, Agnew et al. (1997a)

HS/SSW = Hot Semiworks/Strontium Semiworks

MW = Metal waste.

### C3.2 EVALUATION OF PROCESS FLOWSHEET INFORMATION

Tank 241-C-204 contains a small amount of sludge. Technical flowsheet information for the HS/SSW stream is provided in Table C3-4. The comparative HDW is also provided in this table. The purpose of the comparison is to evaluate the accuracy, completeness, and reliability of the historical data.

Table C3-4. Technical Flowsheet and Hanford Defined Waste Compositions.

Analyte	Flowsheet HS/SSW <sup>a</sup> (mol/L)	HDW <sup>b</sup> HS/SSW (mol/L)
Ba	2 E-04	NR
Ca	0.0049	0.0049
Fe	0.03	0.07
Ce	0.0017	NR
Acetate	1.34	0.51
K	0.078	0.089
Na	4.9	2.21
OH	1.32	0.33
NO <sub>3</sub>	2.1	1.08
Pb	0.034	0.0034
Rare Earths	0.0069	NR
Sr	5 E-04	NR

HDW = Hanford Defined Waste

HS/SSW = Hot Semiworks/Strontium Semiworks

<sup>a</sup> Hill et al. (1995)

<sup>b</sup> Agnew et al. (1997a).

### C3.3 ENGINEERING EVALUATION OF TANK SAMPLE INFORMATION

An estimate of the waste inventory in tank 241-C-204 will be derived using information independent from the composition information contained in Horton (1978).

### **C3.3.1 Hot Semiworks/Strontium Semiworks Composition Estimate**

Table C3-5 provides an estimate of the waste composition in tank 241-C-204 using the waste composition from data extracted from the flowsheet. In-tank photographs of tank 241-C-204 (Section 2.0) show a moist blue/black surface with a region of bright yellow material. There is evidence of standing liquid in the tank from the reflection of the flash. The current differential scan calorimetry thermogravimetric analysis (DSC/TGA) information reflects this observation, with percent water measurements of 56 to 58 percent.

Table C3-5 also shows estimated inventory data for tank 241-C-204 based on the 1978 sampling event of tank 241-C-201 (Horton 1978). The results are for a single composite. Sample recovery appears to have been average to poor and only one riser was sampled. The core sample analysis were not documented to current quality control requirements; however, there is no reason to believe that the samples were not analyzed using good laboratory practice. The tank's process history, inspection of the available data, and visual observation of the current tank photos suggest that spatial heterogeneity may be significant for this tank.

The 1996 analysis was conducted on 2 auger samples. The results do not contain comprehensive chemical species information, because only DSC/TGA, total organic carbon (TOC), organic speciation, and total alpha activity information was collected (Conner 1996).

### **C3.3.2 Basis For Sample Calculations Used In This Independent Evaluation**

The total volume of waste that passed through these tanks is not well quantified and the amount of each contributing waste type is unknown. The HDW model inventory is based on assumptions regarding the physical behavior and composition of the waste types identified from process history, which have not been confirmed. This tank was recently sampled, but very little analytical data were collected; thus, that sampling event is not useful in this process (Conner 1996). Although process information is not complete, Hill et al. (1995) gives a generalized flowsheet for SSW/HS waste which was used to estimate selected analyte inventories. Horton (1978) is used extensively as the engineering estimate, and Hanlon (1997) provides the volume basis.

### **C3.3.3 Assumptions**

The assumptions and observations are based upon best technical judgement pertaining to parameters that can significantly influence tank inventories. These parameters include: (1) correct predictions of contributing waste types, (2) accurate predictions of model flowsheet conditions, fuel processed, and waste volumes, (3) accurate predictions of component solubilities, and (4) accurate predictions of physical parameters such as density, percent solids, void fraction (porosity), etc.

As necessary, the assumptions used can be modified to provide a basis for identifying potential errors and/or missing information that could influence either or both data- and model-based inventories. The simplified assumptions and observations use for predicting the inventory of several analytes in tank 241-C-204 are as follows:

1. Only HS/SSW introduced into tank 241-C-204 contributed to solids formation.
2. Radiolysis of  $\text{NO}_3$  to  $\text{NO}_2$  and any addition of  $\text{NO}_2$  to the waste in tank 241-C-204 for corrosion control purposes are not accounted for in this independent assessment.
3. All Ba, Ca, Ce, Fe, Pb, and Sr from the HS/SSW flowsheet precipitated.
4. The currently accepted surveillance volume, the sample data concentrations, and sample data derived density were used in calculating the data-based inventories. The surveillance volume, the flowsheet concentrations (and other data, such as heat load estimates and 1995 sample data), and sample-based density was used in calculating the engineering assessment-based inventories. The HDW model-based inventories used its internal reference bases.
5. All acetate, K, and  $\text{NO}_3$  were dissolved in the interstitial liquid. Al, Cr,  $\text{PO}_4$ , OH, and F partition between the liquid and solid phases.
6. Concentration of components in interstitial liquid is based on a void fraction of 0.82257 for HS/SSW. Those components were not lost with the evaporation of the supernatant and interstitial liquid.

Estimated component inventories from the evaluation of tank 241-C-201 (Schrieber et al. 1997) have been adjusted by a volume ratio to obtain an engineering evaluation-based inventory estimate for tank 241-C-204. This tank 241-C-204 engineering evaluation-based inventory estimate is compared with tank 241-C-204 data- and HDW-based inventories for selected components in Table C3-5. In addition to sample data, the engineering evaluation-based estimates also used surveillance data and data gathered from the 1995 sampling effort to derive estimates. Observations regarding these inventories are noted by component in the following text.

Table C3-5. Comparison of Selected Component Inventory Estimates  
for Tank 241-C-204 Waste.

Component	Engineering evaluation <sup>a</sup> (MT)	Tank 241-C-201 data-based <sup>b</sup> (MT)	HDW estimated <sup>c</sup> (MT)
Ba	0.013	NR	NR
Ca	0.096	NR	0.026
Ce	0.116	NR	NR
Acetate	0.738	NR	0.094
Fe	0.82	0.817	1.25
K	0.029	0.0053	0.011
Na	1.40	0.36	1.04
OH	0.275	0.066	2.54
NO <sub>3</sub>	1.22	0.437	0.035
Pb	3.44	NR	0.119
Sr	0.021	NR	0
H <sub>2</sub> O (percent)	57.0 <sup>d</sup>	68.0	46.0
Radionuclide	(Ci)	(Ci)	(Ci)
<sup>90</sup> Sr	NR	540	30,800
<sup>137</sup> Cs	NR	101	17.6
<sup>239/240</sup> Pu	0.59 <sup>e</sup>	0.03	16.5

HDW = Hanford Defined Waste

NR = Not reported.

<sup>a</sup> Schrieber et al. (1997), adjusted for tank 241-C-204

<sup>b</sup> Horton (1978), adjusted for tank 241-C-204

<sup>c</sup> Agnew et al. (1997a)

<sup>d</sup> Based on thermogravimetric analyses for the 1995 auger samples (Conner 1996)

<sup>e</sup> Based on total alpha analyses of 1995 auger samples (Conner 1996).

### C3.5 DOCUMENT ELEMENT BASIS

This section compares the data-based estimate, the engineering assessment, and the inventory estimate calculated by the HDW model for selected analytes. Many of the differences observed between the estimates can be attributed to the differences in their respective mass bases. In other cases, the source term for the analyte in the waste type does not appear to be accurately or completely described. Several analytes such as aluminum,

bismuth, chloride, chromium, fluoride, potassium, silicon, zirconium, and uranium are not principal process chemicals in the HS/SSW waste and are not expected to be present.

**Barium.** No comparison with the other estimation methods is possible because barium is not tracked by Agnew et al. (1997a), or reported in the 1978 sample data (Horton 1978). There is a trace amount of barium in this tank.

**Nitrate.** Wide variation is observed between the three estimates. The engineering evaluation is three times larger than the data-based estimate, and both of these estimates are substantially larger than the HDW estimate. The reason for the disagreement between the HDW estimate and the other two methods is not clear; however, it is probably the result of a source term discrepancy.

**Calcium.** The HDW estimated inventory is much smaller than the engineering estimate; however, both indicate that calcium is a relatively small contributors to the waste.

**Cerium.** No comparison with the other estimation methods is possible because cerium is not tracked by Agnew et al. (1997a), or reported in the 1978 sample data (Horton 1978). Based on the assumption that all of the cerium from the HS/SSW flowsheet precipitated, there is a trace amount of cerium in this tank.

**Acetate.** Moderate variation is observed between the estimates. The HDW estimated inventory is approximately 13 percent that of the engineering evaluation. Current sample data from TOC and DSC results support a relatively high energetic organic content.

**Iron.** Modest variation is observed between two estimates. The HDW estimated inventory is 52 percent higher than the engineering evaluation. Because of the dependence of the concentration factor on iron sample and flowsheet data, there is no discrepancy between the engineering evaluation and sample data derived estimates.

**Sodium.** Modest variation is observed between the three estimates. The difference between the extreme values is approximately a factor of three.

**Total Hydroxide.** Once the best-basis inventories were determined, the hydroxide inventory was calculated by performing a charge balance with the valences of other analytes. In some cases, this approach requires that other analyte (e.g., sodium or nitrate) inventories be adjusted to achieve the charge balance. During such adjustments, the number of significant figures is not increased. This charge balance approach is consistent with that used by Agnew et al. (1997a).

**Lead.** Wide variation is observed between the two estimates. No sample data estimate is available. The HDW estimated inventory is almost 30 times smaller than the engineering evaluation. Much of this discrepancy is attributable to the order of magnitude difference between the engineering evaluation and HDW flowsheet concentrations. The flowsheet composition supports a modest to high amount of lead in the waste.

**Strontium.** No comparison with the other estimation methods is possible. Non-radioactive strontium is considered to be zero in Agnew et al. (1997a), and it is not reported in the 1978 sample data (Horton 1978). There is a trace amount of strontium in this tank.

**Water.** Slight variation is observed between the three estimates. The engineering-based estimate (based on 1995 data) and the 1978 data-based estimate are relatively close. The HDW model estimate is lower than the other two; however, it is in relative agreement with the other estimates.

**Strontium-90.** Wide variation is observed between the two estimates. The HDW estimated inventory is over fifty times as large as the data-based evaluation. No estimate based on the heat load in the tank derived from its dome temperature is possible, because there is no dome space temperature readings (Kummerer 1995).

**Cesium-137.** Wide variation is observed between the two estimates. No basis for an engineering estimate is available. The HDW estimated inventory is 57 times smaller than the data-based estimate. The sample data supports a modest amount of  $^{137}\text{Cs}$  in the waste.

**Total Alpha/Plutonium-239/240.** Wide variation is observed between the three estimates. The 1978 data-based estimate provides an extremely low value, over two orders of magnitude smaller than the HDW estimate. The HDW estimated inventory is almost 30 times higher than the 1995 sample-based estimate. The 1995 sample data supports a relatively low inventory of an alpha emitter in the waste. This alpha emitter is conservatively assumed to be  $^{239/240}\text{Pu}$ ; however, there is no quantitative measurement of any of the individual alpha emitters.



## C4.0 DEFINE THE BEST-BASIS AND ESTABLISH COMPONENT INVENTORIES

An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities (Hodgson and LeClair 1996). As part of this effort, an evaluation of chemical information for tank 241-C-204 was performed, and a best-basis inventory was established. This work follows the methodology that was established by the standard inventory task.

The results from this evaluation support using the tank 241-C-201 sample data-derived evaluation where possible as the best-basis inventory for tank 241-C-204 in most cases. However because of the limited amount of data from both the samples and process history, the observed heterogeneity of the sample, and the wide variations in estimates that were derived from the three methods, there is no best source of estimates.

Best-basis inventory estimates for tank 241-C-204 are presented in Tables C4-1 and C4-2. The projected inventory is primarily based on a sample data-based evaluation of the tank; however, engineering estimates and HDW model values have been presented because of the incompleteness in the data. Both the engineering estimate values and data-based values are designated "E" in Table C4-1. The radionuclide inventories shown in Table C4-2 are based on the 1978 core sample results decayed to January 1, 1994, and Agnew et al. (1997b) HDW model estimates.

The inventory values reported in Tables C4-1 and C4-2 are subject to change. Refer to the Tank Characterization Database (TCD) for the most current inventory values.

Best-basis tank inventory values are derived for 46 key radionuclides (as defined in Section 3.1 of Kupfer et al. 1997), all decayed to a common report date of January 1, 1994. Often, waste sample analyses have only reported  $^{90}\text{Sr}$ ,  $^{137}\text{Cs}$ ,  $^{239/240}\text{Pu}$ , and total uranium (or total beta and total alpha), while other key radionuclides such as  $^{60}\text{Co}$ ,  $^{99}\text{Tc}$ ,  $^{129}\text{I}$ ,  $^{154}\text{Eu}$ ,  $^{155}\text{Eu}$ , and  $^{241}\text{Am}$ , etc., have been infrequently reported. For this reason it has been necessary to derive most of the 46 key radionuclides by computer models. These models estimate radionuclide activity in batches of reactor fuel, account for the split of radionuclides to various separations plant waste streams, and track their movement with tank waste transactions.

These computer models are described in Kupfer et al. (1997), Section 6.1, and in Watrous and Wootan (1997). Model generated values for radionuclides in any of 177 tanks are reported in the HDW Rev. 4 model results (Agnew et al. 1997a). The best-basis value for any one analyte may be either a model result or a sample or engineering assessment-based result if available. No attempt has been made to ratio or normalize model results for all 46 radionuclides when values for measured radionuclides disagree with the model. For a discussion of typical error between model derived values and sample derived values, see Kupfer et al. (1997), Section 6.1.10.

Table C4-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-C-204 (Effective Date May 31, 1997). (2 Sheets)

Analyte	Total inventory (kg)	Basis (S, M, E or C) <sup>1</sup>	Comment
Al	21.2	E	
Bi	0	M	
Ca	96	E	
Cl	26.4	E	
TIC as CO <sub>3</sub>	264	E	
Cr	1.77	E	
F	6.59	E	
Fe	817	E	
Hg	0	M	
K	10.9	M	
La	0	M	
Mn	0	M	
Na	1,400	E	
Ni	106	E	
NO <sub>2</sub>	13.2	E	
NO <sub>3</sub>	437	E	
OH	1,090	C	
Pb	3,440	E	
PO <sub>4</sub>	1,950	E	
Si	49.4	E	
SO <sub>4</sub>	85.8	M	
Sr	0	M	
TOC	27.3	E	
U <sub>TOTAL</sub>	0.875	E	

Table C4-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-C-204 (Effective Date May 31, 1997). (2 Sheets)

Analyte	Total inventory (kg)	Basis (S, M, E or C) <sup>1</sup>	Comment
Zr	0	M	

<sup>1</sup>S = Sample-based

M = Hanford Defined Waste model-based, Agnew et al. (1997a)

E = Engineering assessment-based

C = Calculated by charge balance; includes oxides as hydroxides, not including CO<sub>3</sub>, NO<sub>2</sub>, NO<sub>3</sub>, PO<sub>4</sub>, SO<sub>4</sub>, and SiO<sub>3</sub>.

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Table C4-2. Best-Basis Inventory Estimates for Radioactive Components in  
Tank 241-C-204, Decayed to January 1, 1994 (Effective May 31, 1997). (2 Sheets)

Analyte	Total inventory (Ci)	Basis (S, M, or E) <sup>1</sup>	Comment
<sup>3</sup> H	0.008	M	
<sup>14</sup> C	0.0218	M	
<sup>59</sup> Ni	0.423	M	
<sup>63</sup> Ni	41.5	M	
<sup>60</sup> Co	0.00154	M	
<sup>79</sup> Se	0.00548	M	
<sup>90</sup> Sr	376	E	
<sup>90</sup> Y	376	E	Based on <sup>90</sup> Sr
<sup>93</sup> Zr	0.0243	M	
<sup>93m</sup> Nb	0.0206	M	
<sup>99</sup> Tc	0.00256	M	
<sup>106</sup> Ru	9.41 E-06	M	
<sup>113m</sup> Cd	0.0613	M	
<sup>125</sup> Sb	0.00476	M	
<sup>126</sup> Sn	0.00868	M	
<sup>129</sup> I	4.83 E-05	M	
<sup>134</sup> Cs	4.62 E-06	M	
<sup>137</sup> Cs	71	E	1978 sample data = 101 Ci
<sup>137m</sup> Ba	67	E	Based on <sup>137</sup> Cs
<sup>151</sup> Sm	20.5	M	
<sup>152</sup> Eu	0.325	M	
<sup>154</sup> Eu	0.193	M	
<sup>155</sup> Eu	21.3	M	
<sup>226</sup> Ra	3.78 E-05	M	
<sup>227</sup> Ac	1.82 E-04	M	
<sup>228</sup> Ra	2.12 E-10	M	
<sup>229</sup> Th	3.85 E-08	M	
<sup>231</sup> Pa	7.27 E-06	M	
<sup>232</sup> Th	1.06 E-12	M	
<sup>232</sup> U	1.23 E-05	M	
<sup>233</sup> U	7.38 E-07	M	

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Table C4-2. Best-Basis Inventory Estimates for Radioactive Components in  
Tank 241-C-204, Decayed to January 1, 1994 (Effective May 31, 1997). (2 Sheets)

Analyte	Total inventory (Ci)	Basis (S, M, or E) <sup>1</sup>	Comment
<sup>234</sup> U	1.04	M	
<sup>235</sup> U	0.0468	M	
<sup>236</sup> U	0.00664	M	
<sup>237</sup> Np	1.34 E-04	M	
<sup>238</sup> Pu	0.335	M	
<sup>238</sup> U	1.05	M	
<sup>239/240</sup> Pu	0.59	E	Based on total alpha analyses
<sup>241</sup> Am	4.78	M	
<sup>241</sup> Pu	24.2	M	
<sup>242</sup> Cm	0.0077	M	
<sup>242</sup> Pu	1.19 E-04	M	
<sup>243</sup> Am	1.15 E-04	M	
<sup>243</sup> Cm	4.22 E-04	M	
<sup>244</sup> Cm	2.05 E-04	M	

<sup>1</sup>S = Sample-based

M = Hanford Defined Waste model-based, Agnew et al. (1997a)

E = Engineering assessment-based.

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**C5.0 APPENDIX C REFERENCES**

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